

***IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES***

Applicant: Peter MARDILOVICH et al.  
Title: ELECTROLESS DEPOSITION METHODS AND SYSTEMS  
Appl. No.: 10/618,049  
Filing Date: 7/11/2003  
Examiner: Katherine A. BAREFORD  
Art Unit: 1792  
Confirmation Number: 5611

**BRIEF ON APPEAL**

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Sir:

Under the provisions of 37 C.F.R. § 41.37, this Appeal Brief is being filed by EFS-Web together with the appeal fee of \$510.00 under 37 C.F.R. § 41.20(b)(2). If this fee is deemed to be insufficient, authorization is hereby given to charge any deficiency (or credit any balance) to the undersigned deposit account 08-2025.

Applicants appeal the final rejection of claims 1-12, 14-15, and 18-20 in the Office Action dated July 15, 2008.

**I. REAL PARTY IN INTEREST**

The real party in interest is Hewlett-Packard Development Company, L.P. (with a principal place of business in Houston, Texas), the assignee of record.

**II. RELATED APPEALS AND INTERFERENCES**

There is no related proceeding that will directly affect, be directly affected by or have a bearing on the present appeal, that is known to appellant, the assignee, or the appellant's patent representative.

**III. STATUS OF CLAIMS**

The present appeal is directed to claims 1-12, 14-15, and 18-20, which are the claims under consideration. Claims 13 and 16-17 are canceled, and claims 21-30 are withdrawn from consideration. A copy of the claims 1-12, 14-15, and 18-20 under consideration are attached herein in the Claims Appendix.

**IV. STATUS OF AMENDMENTS**

All amendments filed have been entered. There are no unentered amendments.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

The claims relate to a method of forming metal patterns on a substrate, comprising ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate (page 5, line 31, through page 6, line 6); defining a pattern on the electroless active layer (page 9, lines 11-12); ink-jetting a metal composition on the pattern, said metal composition including a metal salt (page 9, lines 13-14); and ink-jetting a reducing agent composition, separate from the metal composition, on the pattern, said reducing agent

composition including a reducing agent, wherein the reducing agent contacts the metal composition and reacts with the metal salt to form a reduced metal on the electroless active layer (page 2, lines 18-22, and page 3, lines 3-7).

**VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

The grounds of rejection to be reviewed on appeal are as follows:

- Rejection of claims 1-4, 6-12, 14-15, and 18-20 as obvious under 35 U.S.C. § 103(a) over U.S. Patent No. 6,120,588 (“Jacobson”) in view of U.S. Patent No. 4,301,196 (“McCormack”).
- Rejection of claim 5 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of Japan 08-319575 (“JP ‘575”).
- Rejection of claim 19 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of U.S. Patent No. 3,918,927 (“Wells”).
- Rejection of claims 1-4, 6-12, 14-15, and 18-20 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of U.S. Patent No. 5,403,649 (“Morgan”).
- Rejection of claim 5 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack and Morgan as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of JP ‘575.

- Rejection of claim 19 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack and Morgan as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of Wells.

No other rejections are pending.

## **VII. ARGUMENT**

The final rejection should be reversed because the references applied against the claims would not have rendered obvious the claimed invention. The applied references would not have led a person of ordinary skill in the art to carry out “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.”

### **A. Rejection of claims 1-4, 6-12, 14-15, and 18-20 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack**

The Office has finally rejected claims 1-4, 6-12, 14-15, and 18-20 as obvious over the combination of Jacobson and McCormack.

Obviousness is a question of law based on underlying factual inquiries, including determining the scope and content of the prior art, the differences between the claimed invention and the prior art; and the level of ordinary skill in the pertinent art. *KSR Int’l Co. v. Teleflex Inc.*, \_\_\_ U.S. \_\_\_, 82 U.S.P.Q.2d 1385, 1391 (2007) (citing *Graham v. John Deere Co.*, 383 U.S. 1 (1966)). “All words in a claim must be considered in judging the patentability of that claim against the prior art.” M.P.E.P. § 2143.03 (quoting *In re Wilson*, 424 F.2d 1382, 1385 (C.C.P.A. 1970)).

Here, the Office erred in mischaracterizing the scope and content of the prior art and the differences between the claimed invention and the prior art.

1. Claim 1 is nonobvious

Combining Jacobson and McCormack fails to satisfy all limitations of claim 1. As explained below, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The Office failed to provide a reason why the combination of Jacobson and McCormack satisfies the limitation “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The Office mischaracterized Jacobson as disclosing that all formulations used in printing circuit boards could be applied by ink-jetting. This error led the Office to conclude that the claims were obvious because McCormack disclosed applying an electroless initiator to a substrate. Based on its overbroad reading of Jacobson, the Office concluded that it would have been obvious to apply the electroless initiator of McCormack by ink-jetting.

Regarding Jacobson, the Office states (final Office Action, page 3, para. 5):

Jacobson teaches a method of forming metal patterns on a substrate. Column 9, lines 15-30. A pattern is decided for application. Column 9, lines 15-30. A metal composition is ink-jetted in the pattern. Figure 9A and column 9, line 60 through column 10, line 10 (the silver nitrate). A separate reducing agent composition with a reducing agent is also ink jetted in the pattern. Figure 9A and column 9, line 60 through column 10, line 10 (the aldehyde). The reducing agent contacts the metal composition and reacts with the metal salt to form a reduced metal. Figure 9A and column 9, line 60 through column 10, line 10 (by the process of "electroless plating"). While Jacobson describes silver nitrate plating, the reference teaches that many other chemistries known in the art of electroless plating can be used. Column 10, lines 1-5.

The Office further states that “Jacobson teaches all the features of these claims except (1) the electroless active layer and that it is applied by ink-jetting an electroless initiator (claim 1)” (final Office Action, page 4, lines 6-7).

The Office erred in interpreting overly broadly the Jacobson disclosure regarding the known use of “many other chemistries.” Jacobson explicitly states, “Many other examples of chemistries suitable for the present system are known in the art of electroless plating.” See column 10, lines 3-4. The Office erred in interpreting the quoted passage to indicate that a person of ordinary skill in the art would consider that all known electroless plating compositions are suitable for application by ink-jet technology.

Jacobson is properly interpreted to mean that other known chemistries might be suitable for use in the specific ink-jet systems of Figures 9A-9D. These systems include a jet containing a metal or semiconductive salt and a jet containing a reducing agent according to Figure 9A (column 9, lines 64-67), a jet containing a metal or semiconductive salt and an electron beam according to Figure 9B (column 10, lines 7-11), a jet containing a metal or semiconductive salt and an electric potential V according to Figure 9C (column 10, lines 13-18), a jet containing a metal or semiconductive salt and a light beam according to Figure 9D (column 10, lines 20-25). These systems, for which Jacobson refers to “suitable chemistries,” do not include an electroless initiator. Jacobson’s statement regarding “chemistries suitable for the present system” does not relate to electroless initiators.

Accordingly, the Office erred in characterizing Jacobson as containing a general disclosure relevant to electroless initiators. Jacobson would not have led a person of ordinary skill in the art to use ink-jet technology to apply other components to the circuit board.

McCormack contributes nothing to encourage use of ink-jet technology to apply an electroless initiator to a substrate. In contrast to Jacobson, McCormack discloses a system for plating copper in a bath: “Usually, the bath is operated at a pH greater than . . .” (column 4,

line 21), “the plating baths of the present invention” (column 6, line 15), “as the baths are used up in plating” (column 6, line 35), and Examples 1-14.

Jacobson’s disclosed ink-jet systems are unrelated to bath plating technology. Jacobson’s ink-jet systems do not involve immersing a substrate in a bath. A person of ordinary skill in the art would have no reason to incorporate into Jacobson’s ink-jet systems a feature of McCormick meant for copper deposition by immersion in a bath.

Obviousness requires an articulated reason for modifying or combining the prior art to yield the claimed invention. *KSR Int’l Co. v. Teleflex Inc.*, \_\_\_ U.S. \_\_\_, 82 U.S.P.Q.2d 1385, 1391 (2007). As noted in the M.P.E.P. (M.P.E.P. § 2142; emphases added):

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. \_\_\_, \_\_\_, 82 USPQ2d 1385, 1396 (2007) noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Federal Circuit has stated that “rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006). See also *KSR*, 550 U.S. at \_\_\_, 82 USPQ2d at 1396 (quoting Federal Circuit statement with approval).

Here, the Office’s articulated reason is far from clear and does not address the limitation of “ink-jetting” the electroless initiator over at least a portion of the substrate. The combination of Jacobson and McCormack yields a first step of treating the substrate “as in conventional processes, with a conventional sensitizing and seeding solution” (McCormack, column 6, lines 55-56) “by immersing the substrate in the initiator” as cited by the Office (Office Action, page 4, line 16). McCormack is silent on ink-jetting.

The Office has not clearly articulated a reason for ink-jetting the electroless initiator of McCormack. As noted above, Jacobson's disclosure of ink-jetting is limited to the systems of 9A-9D. Jacobson does not suggest ink-jetting any other components.

Accordingly, the combination of Jacobson and McCormack would not have rendered obvious the claimed method, in particular "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." The Office's rejection on that ground should be reversed.

2. Claim 2 is nonobvious

Claim 2 depends from claim 1 and limits the metal of the metal salt to "palladium, copper, silver, gold, nickel, cobalt, platinum, rhodium, and mixtures or alloys thereof."

The Office finally rejected claim 2 over the combination of Jacobson and McCormack. Regarding claim 2, the Office stated only that Jacobson discloses silver as metal (Office Action, page 3, lines 2-3 from the bottom, and page 8, lines 4-5 from the bottom).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." Jacobson's disclosure of silver does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 2.

3. Claim 3 is nonobvious

Claim 3 depends from claim 2 and limits the metal to "palladium."



The Office finally rejected claim 3 over the combination of Jacobson and McCormack. The Office apparently relies on McCormack's disclosure of palladium (page 5, lines 3-6).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." McCormack's disclosure of palladium does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 3.

4. Claim 4 is nonobvious

Claim 4 depends from claim 2 and limits the metal to the group consisting of Pd(NH<sub>3</sub>)<sub>4</sub>Cl<sub>2</sub>, Pd(NH<sub>3</sub>)<sub>4</sub>Cl<sub>2</sub>·H<sub>2</sub>O, Pd(NH<sub>3</sub>)<sub>4</sub>(NO<sub>3</sub>)<sub>2</sub>, Pd(NH<sub>3</sub>)<sub>4</sub>(NO<sub>3</sub>)<sub>2</sub>·H<sub>2</sub>O, PdCl<sub>2</sub>, AgNO<sub>3</sub>, Cu(NO<sub>3</sub>)<sub>2</sub>, CuSO<sub>4</sub>, CuSO<sub>4</sub>·5H<sub>2</sub>O, KAu(CN)<sub>2</sub>, Na<sub>3</sub>Au(S<sub>2</sub>O<sub>3</sub>)<sub>2</sub>, NiSO<sub>4</sub>, cobalt salts, and mixtures or hydrates thereof.

The Office finally rejected claim 4 over the combination of Jacobson and McCormack. Regarding claim 4, the Office stated that "the salt can be AgNO<sub>3</sub>" (page 3, last line, and page 8, line 3 from the bottom).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." Jacobson's disclosure of AgNO<sub>3</sub> does not cure this deficiency. Accordingly, this combination would not have rendered obvious claim 4.

5. Claims 6-7 are nonobvious

Claim 6 depends from claim 1 and limits the defines the reducing agent as formaldehyde, hydrazine, sodium hypophosphite, sodium borohydride, dimethylaminoboran; sodium L-ascorbic acid, or mixtures thereof. Claim 7 depends from claim 6 and limits the reducing agent to hydrazine..

Regarding claim 6, the Office stated that the reducing agent in Jacobson can include aldehyde (page 4, lines 1-2, and page 8, last two lines) and the reducing agent in McCormack can include hydrazines (page 5, line 16, and page 9, lines 15-16).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The disclosure in Jacobson of aldehyde does not cure this deficiency. Accordingly, this combination would not have rendered obvious claim 6-7.

6. Claims 8-12 are nonobvious

Claims 8-12 depend from claim 1 and further limit the substrate and process steps.

The Office relied on McCormick for its disclosure of substrate types and corresponding process steps (page 5, line 16, through page 6, line 10, and page 9, line 17, through page 11, line 17).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The disclosure in McCormack of substrate types and process steps does not cure this deficiency.

Accordingly, this combination of references would not have rendered obvious claims 8-12.

7. Claims 14-15 are nonobvious

Claim 14 depends from claim 1 and further limits the electroless initiator to particular metals. Claim 15 depends from claim 14 and limits the metals to a mixture of palladium and tin.

The Office relied on McCormick for its disclosure of palladium and tin as metals of an electroless initiator (page 4, lines 13-15, and page 9, lines 11-13).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The disclosure in McCormack of palladium and tin as metals does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claims 14-15.

8. Claim 18 is nonobvious

Claim 18 depends from claim 1 and requires that electroless initiator be ink-jetted in a non-continuous pattern.

The Office provided no clear articulation regarding its rejection of claim 18 and instead provides the following conclusory statements (page 6, lines 3-10, and page 11, lines 8-15):

It further would have been obvious to deposit the electroless initiator by ink jetting in a non-continuous pattern to correspond to the overlaying metal pattern to be applied so that the minimum amount of initiator material can be used, because as demonstrated by Jacobson, it is well known to use ink jet applicators to apply metal containing compositions onto a substrate in patterns for plating surfaces, and one would expect predictable patterning application results from using ink jet applicators with the known metal containing initiator composition of McCormack.

...

It further would have been obvious to modify Jacobson in view of McCormack to deposit the electroless initiator by ink jetting in a non-continuous pattern to correspond to the overlaying metal pattern to be applied as suggested by Morgan so that the minimum amount of initiator material can be used, because as demonstrated by Jacobson, it is well known to use ink jet applicators to apply metal containing compositions onto a substrate in patterns for plating surfaces, as demonstrated by McCormack, it is desirable to apply initiator/activator layer materials before electroless plating

Such a lack of explanation is erroneous. M.P.E.P. § 2142 (requiring “clear articulation of reasons for obviousness and citing *KSR*).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The Office’s conclusory statements regarding a non-continuous pattern does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 18.

9. Claim 20 is nonobvious

Claim 20 depends from claim 1 and limits the pattern to a circuit.

The Office relied on McCormack for its disclosure of plating to form circuit patterns (page 5, lines 1-2, and page 9, last 2 lines).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of “ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate.” The disclosure in McCormack of plating to form circuit patterns does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 20.

**B. Rejection of claim 5 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of JP '575**

Claim 5 depends from claim 4 and limits the metal salt to  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$ .

The Office finally rejected claim 5 over the combination of Jacobson, McCormack, and Japan 08-319575 (JP '575).

The Office referred simply to the alleged disclosure in JP '575 that " $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$  is a desirable metal salt for electrolessly depositing palladium" (page 7, lines 3-4, and page 12, lines 9-10).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." The disclosure in JP '575 of  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$  does not cure these deficiencies. Accordingly, this combination of references would not have rendered obvious claim 5.

**C. Rejection of claim 19 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of Wells**

Claim 19 depends from claim 1 and adds a step of marring the substrate.

The Office relied on Wells for its disclosure of marring a surface by etching (page 7, lines 11-13, and sentence bridging pages 12-13).

As explained above, the combination of Jacobson and McCormack would not have led a person of ordinary skill in the art to the claimed step of "ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate." The disclosure

in Wells of marring a surface does not cure these deficiencies. Accordingly, this combination of references would not have rendered obvious claim 19.

**D. Rejection of claims 1-4, 6-12, 14-15, and 18-20 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of Morgan**

As explained below, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks.

1. Claim 1 is nonobvious

The office erred in combining Jacobson, McCormack, and Morgan, because Morgan teaches away from ink-jetting. The Office relied on Morgan for its disclosure of ink-jetting metal-containing catalytic inks (Office Action, page 10, lines 7-13). The Office asserted that “as demonstrated by Morgan, it is well known to use ink-jet applicators to apply metal containing catalyst activating inks in patterns before electrolessly plating” (Office Action, page 11, lines 15-17).

Morgan, however, does not cure the deficiency of the Jacobson and McCormack combination. To the contrary, Morgan teaches away from the invention by discouraging ink-jetting catalyst inks.

Morgan describes systems using ink-jet technology in the Background section (column 1, lines 23-43). Morgan then teaches away from ink-jet printing by stating (column 2, lines 28-43):

Despite the variety of printing inks and techniques disclosed as useful for producing printed circuitry and other conductive metal devices, a major deficiency is the slow speed of the methods. For instance, the disclosed screen printing is typically

carried out on stationary substrates using slow drying paste requiring a large holding area to dry the printed image. Although screen printing can be applied to a moving web, such processing is impractical due to the slow drying associated with typically disclosed pastes. Moreover, such pastes typically contain high levels of particulate solids which preclude the use of pastes for fine imaging. Although low viscosity inks are disclosed, the associated printing techniques, e.g. spraying through a template or ink-jet printing, are not typically fast when applied to moving webs.

Morgan discloses gravure printing as preferred solution to the problems associated with ink-jet printing (column 3, lines 29-32). Morgan explains that “the term gravure roll means a rotating printing roll having engraved image forming cavities and is useful in what is known as rotogravure and intaglio printing” (column 4, lines 26-29).

The present facts match those in the example provided by the Manual of Patent Examining Procedure in discussing teaching away (M.P.E.P. § 2145.X.D.1.):

**2. References Cannot Be Combined Where Reference Teaches Away from Their Combination**

It is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.).

Here, Morgan expressly rejects ink-jet technology and uses a different method, gravure printing. Accordingly, the Office erred in combining Morgan with Jacobson and McCormack, and the Board should reverse the rejection.

2. Claim 2 is nonobvious

Claim 2 depends from claim 1 and limits the metal of the metal salt to “palladium, copper, silver, gold, nickel, cobalt, platinum, rhodium, and mixtures or alloys thereof.”

The Office finally rejected claim 2 over the combination of Jacobson, McCormack, and Morgan. Regarding claim 2, the Office stated only that Jacobson discloses silver as metal (Office Action, page 3, lines 2-3 from the bottom, and page 8, lines 4-5 from the bottom).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. Jacobson’s disclosure of silver does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 2.

3. Claim 3 is nonobvious

Claim 3 depends from claim 2 and limits the metal to “palladium.”

The Office finally rejected claim 3 over the combination of Jacobson, McCormack, and Morgan. The Office apparently relies on McCormack’s disclosure of palladium (page 5, lines 3-6).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. McCormack’s disclosure of palladium does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 3.



4. Claim 4 is nonobvious

Claim 4 depends from claim 2 and limits the metal to the group consisting of  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$ ,  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2 \cdot \text{H}_2\text{O}$ ,  $\text{Pd}(\text{NH}_3)_4(\text{NO}_3)_2$ ,  $\text{Pd}(\text{NH}_3)_4(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ ,  $\text{PdCl}_2$ ,  $\text{AgNO}_3$ ,  $\text{Cu}(\text{NO}_3)_2$ ,  $\text{CuSO}_4$ ,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{KAu}(\text{CN})_2$ ,  $\text{Na}_3\text{Au}(\text{S}_2\text{O}_3)_2$ ,  $\text{NiSO}_4$ , cobalt salts, and mixtures or hydrates thereof.

The Office finally rejected claim 4 over the combination of Jacobson, McCormack, and Morgan. Regarding claim 4, the Office stated that “the salt can be  $\text{AgNO}_3$ ” (page 3, last line, and page 8, line 3 from the bottom).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. Jacobson’s disclosure of  $\text{AgNO}_3$  does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 4.

5. Claims 6-7 are nonobvious

Claim 6 depends from claim 1 and limits the defines the reducing agent as formaldehyde, hydrazine, sodium hypophosphite, sodium borohydride, dimethylaminoborane; sodium L-ascorbic acid, or mixtures thereof. Claim 7 depends from claim 6 and limits the reducing agent to hydrazine..

Regarding claim 6, the Office stated that the reducing agent in Jacobson can include aldehyde (page 4, lines 1-2, and page 8, last two lines) and the reducing agent in McCormack can include hydrazines (page 5, line 16, and page 9, lines 15-16).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in Jacobson of aldehyde does not cure this

deficiency. Accordingly, this combination of references would not have rendered obvious claim 6-7.

6. Claims 8-12 are nonobvious

Claims 8-12 depend from claim 1 and further limit the substrate and process steps.

The Office relied on McCormick for its disclosure of substrate types and corresponding process steps (page 5, line 16, through page 6, line 10, and page 9, line 17, through page 11, line 17).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in McCormack of substrate types and process steps does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claims 8-12.

7. Claims 14-15 are nonobvious

Claim 14 depends from claim 1 and further limits the electroless initiator to particular metals. Claim 15 depends from claim 14 and limits the metals to a mixture of palladium and tin.

The Office relied on McCormick for its disclosure of palladium and tin as metals of an electroless initiator (page 4, lines 13-15, and page 9, lines 11-13).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in McCormack of palladium and tin as metals

does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claims 14-15.

8. Claim 18 is nonobvious

Claim 18 depends from claim 1 and requires that electroless initiator be ink-jetted in a non-continuous pattern.

The Office provided no clear articulation regarding its rejection of claim 18 and instead provides the following conclusory statements (page 6, lines 3-10, and page 11, lines 8-15):

It further would have been obvious to deposit the electroless initiator by ink jetting in a non-continuous pattern to correspond to the overlaying metal pattern to be applied so that the minimum amount of initiator material can be used, because as demonstrated by Jacobson, it is well known to use ink jet applicators to apply metal containing compositions onto a substrate in patterns for plating surfaces, and one would expect predictable patterning application results from using ink jet applicators with the known metal containing initiator composition of McCormack.

. . .

It further would have been obvious to modify Jacobson in view of McCormack to deposit the electroless initiator by ink jetting in a non-continuous pattern to correspond to the overlaying metal pattern to be applied as suggested by Morgan so that the minimum amount of initiator material can be used, because as demonstrated by Jacobson, it is well known to use ink jet applicators to apply metal containing compositions onto a substrate in patterns for plating surfaces, as demonstrated by McCormack, it is desirable to apply initiator/activator layer materials before electroless plating

Such a lack of explanation is erroneous. M.P.E.P. § 2142 (requiring “clear articulation of reasons for obviousness and citing *KSR*”).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The Office's conclusory statements regarding a non-continuous pattern does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 18.

9. Claim 20 is nonobvious

Claim 20 depends from claim 1 and limits the pattern to a circuit.

The Office relied on McCormack for its disclosure of plating to form circuit patterns (page 5, lines 1-2, and page 9, last 2 lines).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in McCormack of plating to form circuit patterns does not cure this deficiency. Accordingly, this combination of references would not have rendered obvious claim 20.

**E. Rejection of claim 5 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack and Morgan as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of JP '575**

Claim 5 depends from claim 4 and limits the metal salt to  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$ .

The Office finally rejected claim 5 over the combination of Jacobson, McCormack, Morgan, and JP '575.

The Office referred simply to the alleged disclosure in JP '575 that " $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$  is a desirable metal salt for electrolessly depositing palladium" (page 7, lines 3-4, and page 12, lines 9-10).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in JP '575 of  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$  does not cure these deficiencies. Accordingly, this combination of references would not have rendered obvious claim 5.

**F. Rejection of claim 19 as obvious under 35 U.S.C. § 103(a) over Jacobson in view of McCormack as applied to claims 1-4, 6-12, 14-15, and 18-20 above and further in view of Wells**

Claim 19 depends from claim 1 and adds a step of marring the substrate.

The Office relied on Wells for its disclosure of marring a surface by etching (page 7, lines 11-13, and sentence bridging pages 12-13).

As explained above, the combination of Jacobson, McCormack, and Morgan was improperly made, because Morgan teaches away from the very feature that the Office applied it for, ink-jetting catalyst inks. The disclosure in Wells of marring a surface does not cure these deficiencies. Accordingly, this combination of references would not have rendered obvious claim 19.

**CONCLUSION**

Applicants respectfully submit that all claims on appeal are allowable over the art of record. Applicants request reversal of the Examiner's rejection of claims 1-12, 14-15, and 18-20.

*At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 C.F.R. § 1.25. Additionally, charge any fees to Deposit Account 08-2025 under 37 C.F.R. § 1.16 through § 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.*

Respectfully submitted,

Date: 3-OCT-2008

HEWLETT-PACKARD CO.  
Customer Number: 22879

By

A handwritten signature in black ink, appearing to read 'Rouget F. Henschel', written over a horizontal line.

Rouget F. Henschel  
Attorney for Applicant  
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### **VIII. CLAIMS APPENDIX**

1. (Previously Presented) A method of forming metal patterns on a substrate, comprising:
  - a) ink-jetting an electroless initiator as an electroless active layer over at least a portion of the substrate;
  - b) defining a pattern on the electroless active layer;
  - c) ink-jetting a metal composition on the pattern, said metal composition including a metal salt; and
  - d) ink-jetting a reducing agent composition, separate from the metal composition, on the pattern, said reducing agent composition including a reducing agent, wherein the reducing agent contacts the metal composition and reacts with the metal salt to form a reduced metal on the electroless active layer.
2. (Original) The method of claim 1, wherein the metal of the metal salt is selected from the group consisting of palladium, copper, silver, gold, nickel, cobalt, platinum, rhodium, and mixtures or alloys thereof.
3. (Original) The method of claim 2, wherein the metal composition further comprises a metal salt of palladium.
4. (Original) The method of claim 2, wherein the metal salt is a member selected from the group consisting of  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$ ,  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2 \cdot \text{H}_2\text{O}$ ,  $\text{Pd}(\text{NH}_3)_4(\text{NO}_3)_2$ ,

$\text{Pd}(\text{NH}_3)_4(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ ,  $\text{PdCl}_2$ ,  $\text{AgNO}_3$ ,  $\text{Cu}(\text{NO}_3)_2$ ,  $\text{CuSO}_4$ ,  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{KAu}(\text{CN})_2$ ,  $\text{Na}_3\text{Au}(\text{S}_2\text{O}_3)_2$ ,  $\text{NiSO}_4$ , cobalt salts, and mixtures or hydrates thereof.

5. (Original) The method of claim 4, wherein the metal salt is  $\text{Pd}(\text{NH}_3)_4\text{Cl}_2$ .
6. (Original) The method of claim 1, wherein the reducing agent comprises a member selected from the group consisting of formaldehyde, hydrazine, sodium hypophosphite, sodium borohydride, dimethylaminoborane; sodium L-ascorbic acid, and mixtures thereof.
7. (Original) The method of claim 6, wherein the reducing agent is hydrazine.
8. (Original) The method of claim 1, wherein the substrate comprises a member selected from the group consisting of ceramics, polymers, cellulose, glass, silicon, organic substrates, metal oxides, and mixtures or composites thereof.
9. (Original) The method of claim 1, further comprising heating the metal composition and reducing agent compositions on the pattern, wherein the heating is performed at a temperature from 20 °C to about 90 °C.
10. (Original) The method of claim 1, further comprising the step of forming multiple layers of reduced metal by repeating the ink-jetting of metal composition and reducing agent composition such that the reduced metal has a predetermined depth.



11. (Original) The method of claim 10, wherein the predetermined depth is from about 0.01  $\mu\text{m}$  to about 100  $\mu\text{m}$ .

12. (Original) The method of claim 1, wherein the reducing agent is ink-jetted on the pattern in an offset area with respect to the metal composition, wherein a portion of each of the metal composition and reducing agent composition are not ink-jetted on the same portions of the pattern.

13. (Canceled).

14. (Previously Presented) The method of claim 1, wherein the electroless initiator comprises a member selected from the group consisting of palladium, aluminum protected copper, silver, and mixtures thereof.

15. (Original) The method of claim 14, wherein the electroless initiator is a mixture of palladium and tin.

16.-17. (Canceled).

18. (Previously Presented) The method of claim 1, wherein the electroless initiator is ink-jetted in a non-continuous pattern.

19. (Original) The method of claim 1, wherein the step of ink-jetting of the electroless initiator further includes the step of marring the substrate along the pattern.

20. (Original) The method of claim 1, wherein the pattern is a circuit.

**IX. EVIDENCE APPENDIX**

None. There is no item of related evidence that will directly affect, be directly affected by or have a bearing on the present appeal, that is known to appellant, the assignee, or the appellant's patent representative.

**X. RELATED PROCEEDINGS APPENDIX**

None.